

Report modes of thinking , UML, MIT

UML → unified modeling language diagrams.
 عبارة عن لغة النمذجة الموحدة للبرمجيات SW

modeling → is abstraction of reality. تجريد عن الحقيقة

discrete model Model مثل توافق العناصر (قطع)

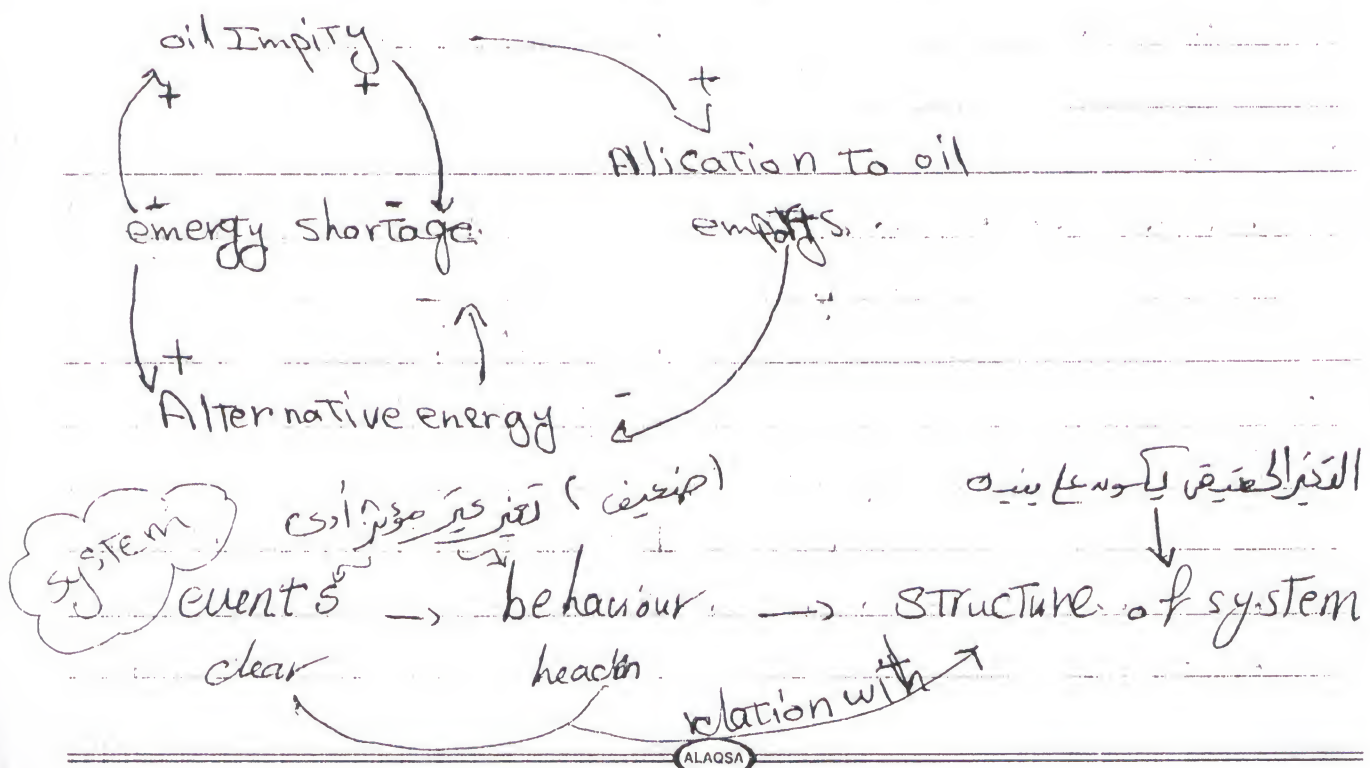
physical model Model مثل نموذج فيزيائي

Continuous model

mathematical modeling Model رياضي

Stochastic model

Quick solution حل سريع أسهل وأسرع
 Fundamental solution حل حقيقي



using modeling for:

1- solve problem.

2- sensitivity analysis

Current state - initial, final states. and model is difference between initial, final states. ← problem

fundamental solution. time delay solution.

* Same times the queue (الوقت) with delay is more worst than the effect of the decision (القرار)

quick solution ← * أي حل سريع
(Take long-time) Fundamental solution

* problem = destined - wanted. (الذي لا يريد - الذي لا يمكنه)

Problem characteristic.

① problem can be or not composed. (أي نقدر نحلها أو لا)

أي شيء نتجزئه لأجزاء كل منفردة أم لا.

ex: so mathematical problems, medical problem.

② The solution steps accept undo or not.

المشكلة التي نقبل الرجوع تصبح أسهل في الحل

③ The solution is relative or absolute.

human 99% of their decision is relative decision.

absolute solution.

solution that we wish to achieve without comparison with any other things.

relative solution of a problem is more difficult.

(4) The solution steps is path or state.

هل الحل عبارة عن حالة مرسومة أو مرسومة لها أم مرسومة فيها.

ex: state puzzle

path work (is more difficult)

(5) the environment of solution or problem is predictable or not. environment is effect on any system.

ex: Chess (الشطرنج), taxi driver.

(6) The role of knowledge: (related to the problem)

المعرفة دورها في المسألة (المعرفة ذات الصلة بالمشكلة)

(7) Role of human in problem.

حل المشكلة بدون بشر أسهل من استخدام الإنسان وهذا يؤدي إلى اختلاف model

model without human. is more easy than with human.

lect

* Two Loops

→ Balanced loop.
→ enforced loop.

أي system في البداية يتولد إلى

منه

* limit of growth.

* Causal loop diagram

* أكسب وف شأنا لا ياب على المسألة

* يتوقف عدد - , +
 no. of + odd → Balanced.
 no. of - even → unbalanced

* Stability. Balanced \cong enforce.

* system behaviour
 is dependent on no. of loops.

€ eighty twenty (80, 20)

أي 80% من المسألة يحلها 20% من الأسباب

(الحلقة)

Foundamental solution قد توذى إلى تراجع التقديم quick solution

I think. depend on.

* Causal loop diagram.

* Stock Flow.

Stock

Flow

عند توقف الوقت لـ Stock

(احتيايات فلووس)

مرتبط بالوقت

(يصرف الفلووس)

خاصه موجوده قابل للزيادة والنقصان

أي system

موجوده من Stocks ويستقبل من Stock لـ Stock على طريقه Flow

* الألف باء physical meaning is integration.

Types of Stock

① material

② personal

③ Capital equipment (أي مفيش مواد ولكن يوجد معدات أو أصل رأسماني) على أدارة الإنتاج

④ orders

"زي شخص ياخذ أوامر ويعطي الأشخاص أوامر أيضا"

⑤ money

⑥ information

Auxiliary variable

هو عبارة عن مستغير خارجي يغير من النظام

ولكن يؤثر على ديفاصيكيب النظام. مثل (المنافسين لأي شركة)

Stock Flow model

① Stock

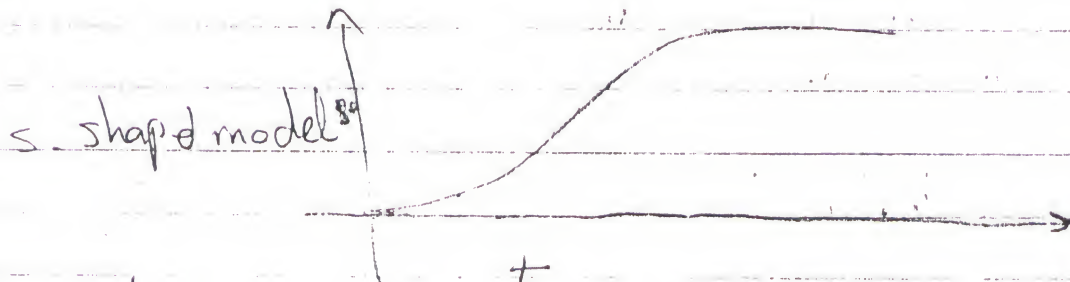
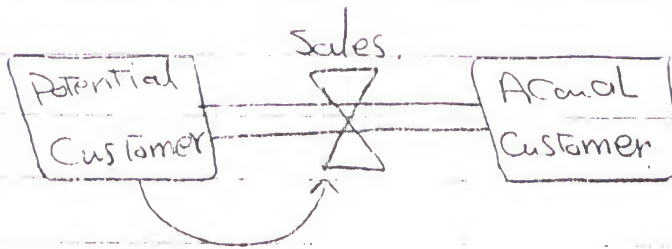
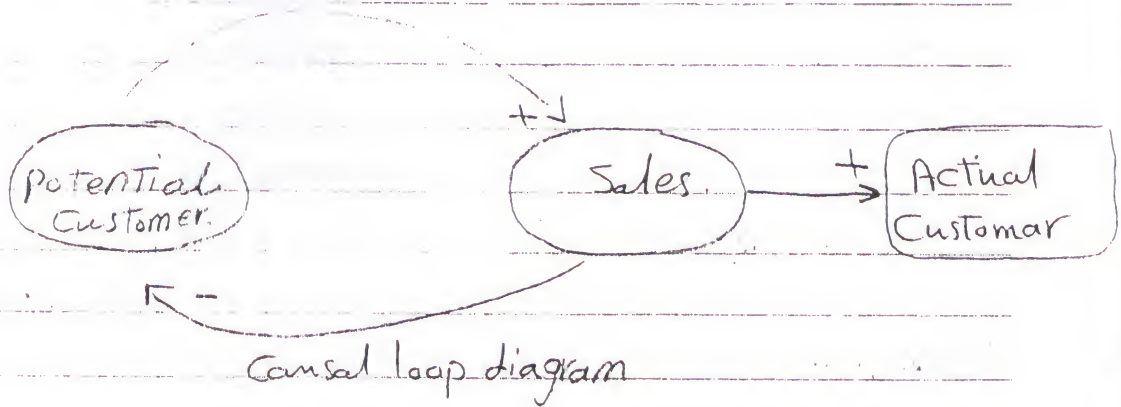
② Flow

③ auxiliary variable

Subject : _____

Date : _____

* عند دراسة أي model يجب اعتبار المتغيرات الداخلية والخارجية



$$\text{Actual Customer} = \int_0^t \text{Sales} \, dt$$

$$\text{Potential} = I - \text{Actual model}$$

العملية التي (تتخذ قراراً مستقبلياً) والمقصود به CP (ملاحظة)
 simulation, modeling, simulation. (ملاحظة)

Subject : _____

Date : _____

potential Customer x
من دوران Cisco كذا الطلبية التي يدخلها أربع فرق = استبيان

actual Customer x

لها الطلبية في سجلي بالفعل

negative. لا يقبل ال Stack. x

Flow. x
أيضا " " " "

simulation. performance

State available. (Flow).

متغيرات الحالة (x', x'', x''', x''')

System

internal Flow (من داخل النظام)

Flow of data خارج عن النظام

external Flow

* stock order (مستفيد من النظام) (مثل الطالب (مستفيد من النظام) والأكبر)

extengle entity ← data. لا يأتى Data من النظام أو يمد النظام بال data.

(UML) unified modeling language ← DFD *

Data Flow diagram.

أداة لنظر النظام إلى data من مكان إلى مكان النظام

System

group of entities @ operated to do some tasks

group of interconnected subsystem.

goals

عند تصميم عيوب system يجب البدء بالتصميم إذا ما أراد أن نعمل شيئاً

لا يمكن للشخص أن يكون Decision maker, taker في نفس الوقت

manager → decision maker.

* نقوم بدراسة المشكلة من كل الجوانب ونعمل modeling (نصنع نموذجاً) decision maker (صانع القرار) *
* نختار القرار النهائي decision taker.

* —→ causal loop diagram meren : There are adelay Time.

أي تأثير ال loop يظهر تأثيره وتأثيره بعد فترة من الزمان.

ازاحه التبدل
 Shifting the herding.
 أي عمل تأجيل لها. أدر تم توزيعها وتقسيمها
 حل سريع (Quick solution.)

ex DFD oop
 structure.

المكتبة

- * عبارة عن مجموعة من objects التي تتفاعل مع بعضها message.
- * طريقة التواصل بين objects ويتم كددها داخل method.
- * class كددها لا method (without specific attributes)
- * objects ذات methods المتساوية يتم تجميعهم داخل class واحد
- * لكن الموجود في الحقيقة objects (specialization)
- * التوليف (generalization) وتسمى التماثل (specialization)

* عبارة عن diagram (analysis, design, programming) UML نوع
 (نوع العملية) (نوع الكتاب) (نوع الشخص) (نوع الوقت)
 أي تحتوي على methods إلى محتاج إليها وال data الخاص بها.

Function decomposition ← الفك الوظيفي للنظام

DFD

- External entity (المقرير) مثل الطالب بالسيد للكلية
- process (is an action in the system).
- Data Store (مثل السجل كلة)
- Data Flow " كوانتال البيانات مكوّن DFD إلى مكوّن آخر "

يمكنه external entity أنه يمكن من التّخبر في external entity

Systems → interactive systems.
→ isolated systems. لا يوجد هذا النوع في الواقع

Data Store. أي يتم تخزين data وإخراجها مرة أخرى.

Bussens developer (modeler).

الكون universe. ← كيان System

لا يوجد System بدون

- data store (مكتبة أو P.O. أو IP نقطة)
- external entities
- process (الامتحان - السّجّل)
- data flow

لا يوجد تواصل بين data store - data store

external entities - external entities

process - external entity

external entity يظهر داخل النظام على هيئة actions
(send data or receive data).

* المتيحة عبارة عن Data Flow .

* entity عبارة عن خاصية متضمنة مجموعة attributes .

* الرمز هو المتيح الوحد العنر معنن في تغيره أي متغير آخر .

Dynamic process (T is independent)
 Static DFD أي مجموعة خطوات ثابتة عند تكرار نفس action

DFD — Function decomposition
 — Static modeling

process يجب اعتبار (verb) وليزا أرقا وليم سورا

④ المريض إلى المستشفى : external entity

DFD — يتم رسمه على هيئة leveling

process — الوحدة التي تحتوي على child و parent
 SubProcess أدنى تتجه إلى مجموعة من

و عند التسقيت يبدأ من أعلى إلى أسفل .

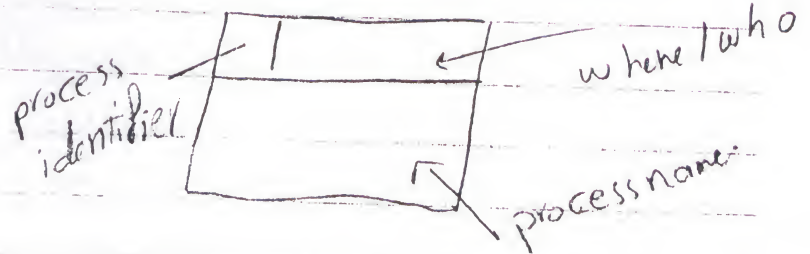
DFD يحدد process ولكنه لا يحدد كد به levels التي هيكل دارة

OOP — تقدم في Business أكبر

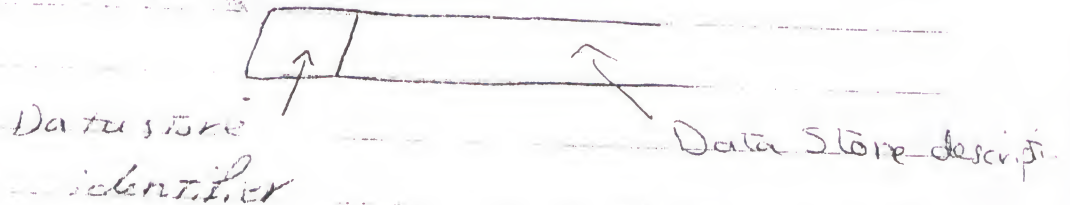
① external entity



② process



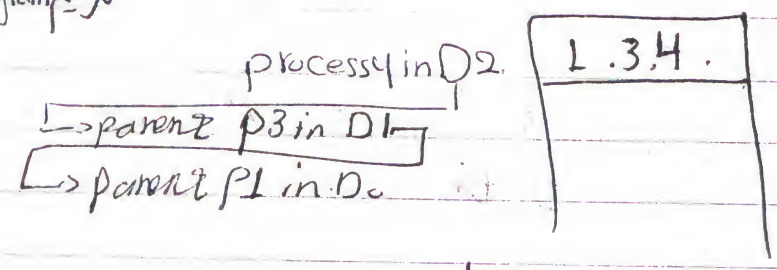
Data Store



Context Diagram

Data oriented modeling.

0, 1, 2 Diagram ترقيم



ستبع DFD Modeling

* على leveling ينتهي بانتهاء مستوى التفاصيل.

verb (action) → process.
 sheet, File, access, DB, دفتر - excel sheet → Data store

أي اسم توصيف للعلاقة بين النظام والأنظمة الأخرى.

external entity ← تظهر (process) action

* يتكون من single process + النظام + external entity
 (أي تفاعل النظام أو تطبيق)

* لا يحتوي Data store إلا على مستوى تفاصيل داخلي للنظام لذلك تظهر فقط في DFD.

* Data Flow diagram.

Subject : _____

Date : _____

oo A object oriented Analysis.
oo D " " Data modeling.
oo P " " programming.

DFD

↳ systematic thinking
↳ data store

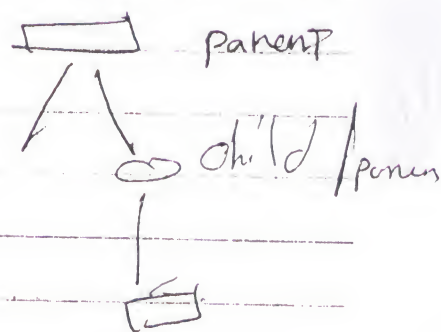
DFD

{ Data dictionary
{ process description

Bussens Rules

leveling

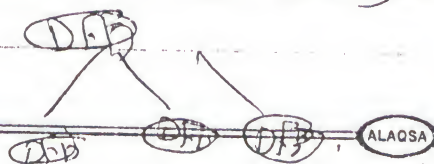
Level up restriction.



Balancing

* outp, inp & data store
i/p, o/p & data store analysis

parent → child analysis



Subject : _____

Date : _____

Data item

Data Flow

Data dictionary

توضيح وشرح
Data items

يظهر في ال Diagram

Data unit
أي وحدة بيانات
على وجه آخر

عند المستوى level
aggregation of Data flow
decomposition

لا يصح أن يتم DRP

Introduction to Simulation.

Simulation

is imitation of the operation of a real-world process or system over time.

Brief explanations -

The behavior of a system as it evolves over time is studied by developing a simulation model.

model is Form of a set of assumptions concerning the operations of the system.

The assumptions are expressed in.

- Mathematical relationships
- Logical relationship
- Symbolic relationship.

When simulation is the Appropriate tool?

1. Simulation enables study and experimentation with the internal interactions of a complex system.
 2. Information, organizational and environmental changes can be simulated.
- The Knowledge gained in designing a simulation.

model can be great value suggesting improvement in the system under investigation.

- 4- Simulation can be used to experiment with new designs or policies prior to implementation.
- 5- Simulation can be used to verify analytic solutions.
- 6- by simulating different capabilities for a machine, requirements can be determined.
- 7- Animation shows a system in simulated operation so that the plan can be visualized.

When Simulation is Not Appropriate?

- 1- Simulation should be used when the problem cannot be solved using common sense.
- 2- Simulation should not be used if the problem can be solved analytically.
- 3- Simulation should not be used, if it is easier to perform direct experiments.
- 4- Simulation should not be used, if the costs exceeds savings.
- 5- simulation should not be used if the resources or time are not available.

Advantages of simulation.

1. Simulation can also be used to study systems in the design stage.
2. Simulation models are run rather than solved.
3. "What if" questions can be answered, useful in the design of new systems.
4. Time can be compressed or expanded allowing for a speedup or slowdown of the phenomena under investigation.
5. New HW designs, physical layouts, transportation systems can be tested without committing resources for their acquisition.
6. A simulation study can help in understanding how the system operates rather than how individuals think the system operates.

Disadvantages of simulation.

- Model building requires special training.
- Simulation results may be difficult to interpret.
- Simulation modeling and analysis can be time consuming and expensive.

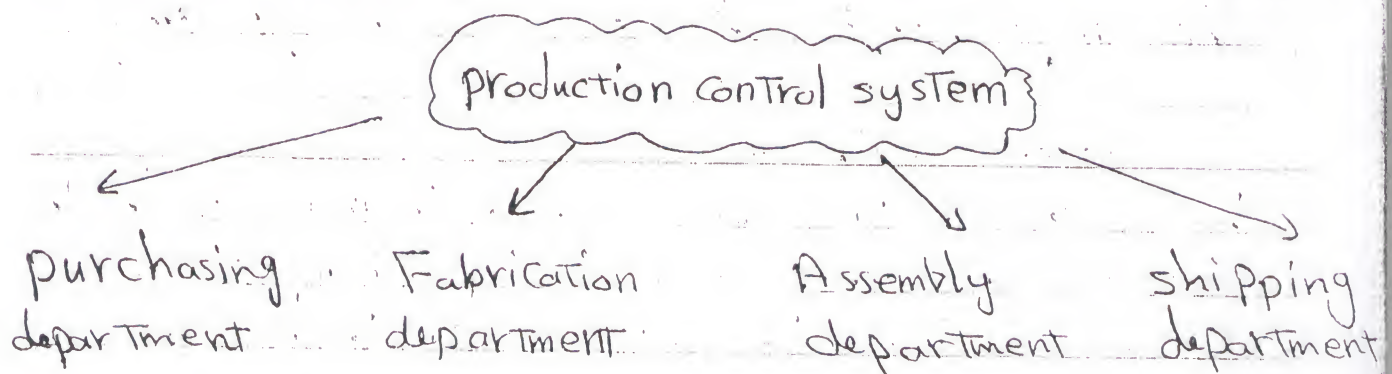
4- Simulation is used in some cases when an analytical solution possible or even preferable.

Applications of simulation.

- 1- manufacturing Applications
- 2- semiconductor manufacturing
- 3- Construction engineering
- 4- military Applications
- 5- Logistics, Transportation and Distribution Applications
- 6- Business process simulation
- 7- Human systems

Systems

A system is defined as an aggregation or assemblage of objects joined in some regular interaction or interdependence toward the accomplishment of same purpose.



Components of a system:

- 1- Entity (is an object of interest in a system)
- 2- Attribute. (denotes the property of an entity)
- 3- Activity Any process causing changes in a system is called as an activity.
- 4- State of the system.
is defined as the collection of variable necessary to describe a system at any time, relative to the objective of study.
or
a description of all the entities, attributes and activities as they exist one point in time.
- 5- event
An event is defined as an instantaneous occurrence that may change the state of the system.
- 6- System Environment.
The external components which interact with the system and produce necessary changes are said to continue the system environment.

Compaine.

* Endogenous system

The term endogenous system is used to describe activities and events occurring within a system

EX Drawing cash in bank

* Exogenous system

The term exogenous is used to describe activities and events in the environment that affect the system

EX Arrival of customers

* Closed system

A system for which there is no exogenous activities and event is said to be a closed

EX water in an insulated flask

* open system

A system for which there is exogenous activities and event is said to be an open

EX Bank system

* Continuous system

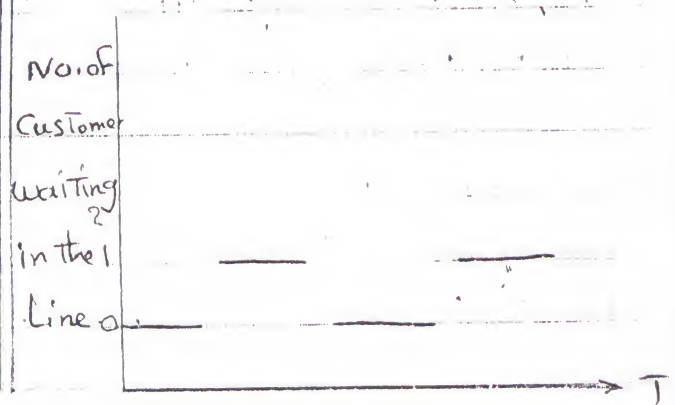
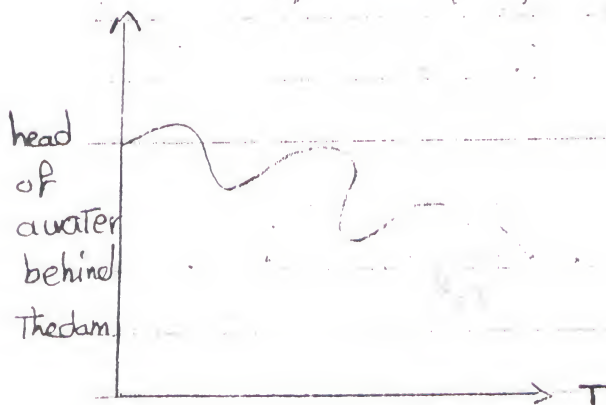
system in which the changes are predominantly smooth are called continuous system

EX Head of water behind a dam

* discrete system

system in which the changes are predominantly discontinuous are called discrete system.

EX bank (no. of customers)



mode of a system.

A model is defined as a representation of a system for purpose of studying the system.

Types of models.

- mathematical or physical model.
- Static model
- Deterministic model
- Stochastic model
- Discrete model
- Dynamic model
- Continuous model.

* mathematical model:

uses symbolic notation and mathematical equations to represent a system.

* Static model.

Represent a system at a particular point of time and also known as monte-carlo simulation.

* Dynamic model.

represents system as they change over time.

EX: Simulation of a bank.

* Deterministic model.

Contains no random variables. They have a known set of inputs which will result in a unique set of outputs.

Ex: Arrival of patients to the Dentist at the scheduled appointment time

* Stochastic model.

has one or more random variable as inputs. Random inputs lead to random output.

Ex: Simulation of a bank involves random interarrival and service times.

* discrete and continuous model.

used in an analogous manner. Simulation models may be mixed both with discrete and continuous. The choice is based on the characteristics of the system.

* discrete-event system simulation

modeling of system in which the state variable changes only at a discrete set of points in time.

Steps in a simulation study

① problem formulation

every study begins with a statement of problem, provided by policy makers.

2. setting of objectives and overall project plan
the objectives indicate the questions to be answered by simulation. the overall project plan should include.

3. model conceptualization.

the construction of a model is probably as much art as science.

4. Data collection

there is a constant interplay between the construction of model and the collection of needed input data.

5. model translation

real world system result in models that require a great deal of information storage and computation.

6. verified

it pertains to his computer program and checking the performance if the input parameters and logical structure and correctly represented. verification is completed.

7. validated.

it is the determination that a model is an accurate representation of the real system.

8. Experimental Design.

The alternatives that are to be simulated must be determined.

For each system design, decisions need to be made concerning

- length of the initialization period.
- length of simulation runs.
- number of replication to be made of each run.

9. production runs and analysis.

They are used to estimate measures of performance of the system designs that are being simulated.

10. More runs

Based on the analysis of runs that have been completed.

11. Documentation and reporting

- Two type of documentation
- 1- program documentation.
 - 2- process documentation.

12. implementation.

Success depends on the previous steps.

* The simulation model building can be broken into 4 phases

phase I

- Consist of steps 1 and 2
- it's period of discovery / orientation.

- the analyst may have to restart the process if it is not fine tuned.
- Recalibrations and clarifications may occur in this phase or another phase.

phase II

- Consists of steps 3, 4, 5, 6, 7
- A continuing interplay is required among the steps
- Exclusion of model user results in implications during implementation.

phase III

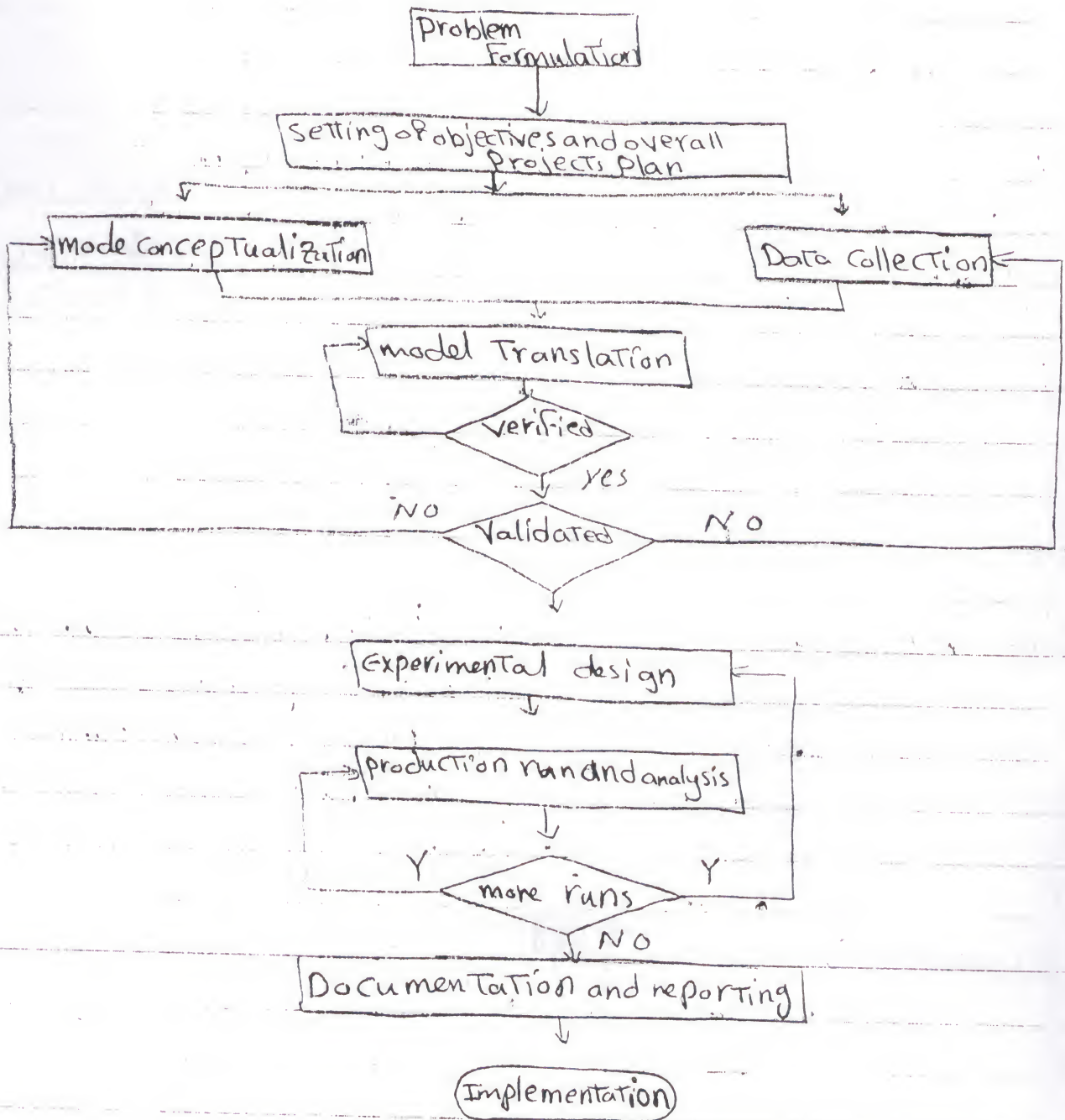
- Consists of steps 8, 9, 10
- conceives a through plan for experimenting.
- Discrete-event stochastic is statical experiment.
- the o/p variables are estimates that contain random error

phase IV

- Consists of steps 11, 12
- Successful implementation depends on the involvement of user and every step's successful completion.

Subject : _____

Date : _____



DB.
 → SQL
 → NO SQL

Data
 → Structured data : relational algebra.
 → unstructured data (relational algebra)
 is * any thing can be measured or vision. (Facts.)

DB consist
 → Entity (
 → Attributes
 → relationships
 → Constraints.

Types of Entity
 → week entity |
 → associative entity
 → attributive entity (entity is take from parent.
 Student →
 Fundamental entity.
 → associative.
 week.
 Ry المسافر والطياره والتشيرة.

attributes

single attribute.

Composed

Multi variable attribute (
 مركب المتغير
 المتغير - المركب - المتغير

&

Multi Variable composed
 متغير مركب

Subject : _____

Date : _____

relation types . one to one .

• many to one

• one to many

• many to many

* Constraints . * cardinality .

* Domain Constraints . * Caption .

domain & max & min * أي يحدد

* لا يوجد DB من دون Constraints .

Cardinality

المدال الذي أو الرقعة الكفاة على العلاقة

entity (relation) وليت . تصف العلاقة

DB. Conceptual modeling.
Logical modeling,
physical modeling.

Referential integrity . التكمال المرجعي .

أحاديث أنواع constraints

EED

Enhanced entity Data relationship diagram.

1) ERD لا يتداخل (overlapping) و ERD لا يتداخل (non-overlapping)

2 entity موجود في object

3) inheritance (ميراث)

4) attributive entity (كيان صفاتي) في ERD و ERD لا يتداخل (non-overlapping)

generalization (تعميم) / specialization (تخصص) / case (حالة) موجود في ERD

Simulation.

is the imitation of the operation of a real-world process or system over time.

Brief explanation:-

- The behavior of a system as it evolves over time is studied by developing a simulation model.
- This model takes the form of a set of assumptions concerning the operation of the system.

The assumptions are expressed in:-

mathematical relationships.
logical relationships.
symbolic relationships.

Between the entities of the system.

modeling.

Simplified representation of a system using mathematical equation.

we simulate a model to study the behavior of a system. need to verify that our model is correct. expect results.

Subject : _____

Date : _____

Types of Models.

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- 5- Stochastic Model
- 6- Discrete Model
- 7- Continuous Model.

Vensim

is a software designed for modeling one or more quantities that change over time.



select or drag object



Lock button

delete button

Building the Model

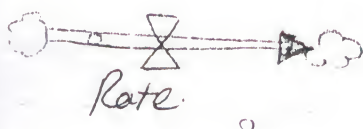
Step 0: Basic Building Blocks.

Box level variable

Box variables represent quantities. These are the main (nouns) in a system and are sometimes referred to as level variable.

Subject : _____

Date : _____



Rate represent changes over time. These are the main 'verbs' in a system and are sometimes referred to as level variable.

Auxiliary variable.

represent constants and other parameters. These loosely correspond.



Connects indicate dependencies between objects. In other words, I need to know this to calculate that.

Building the model

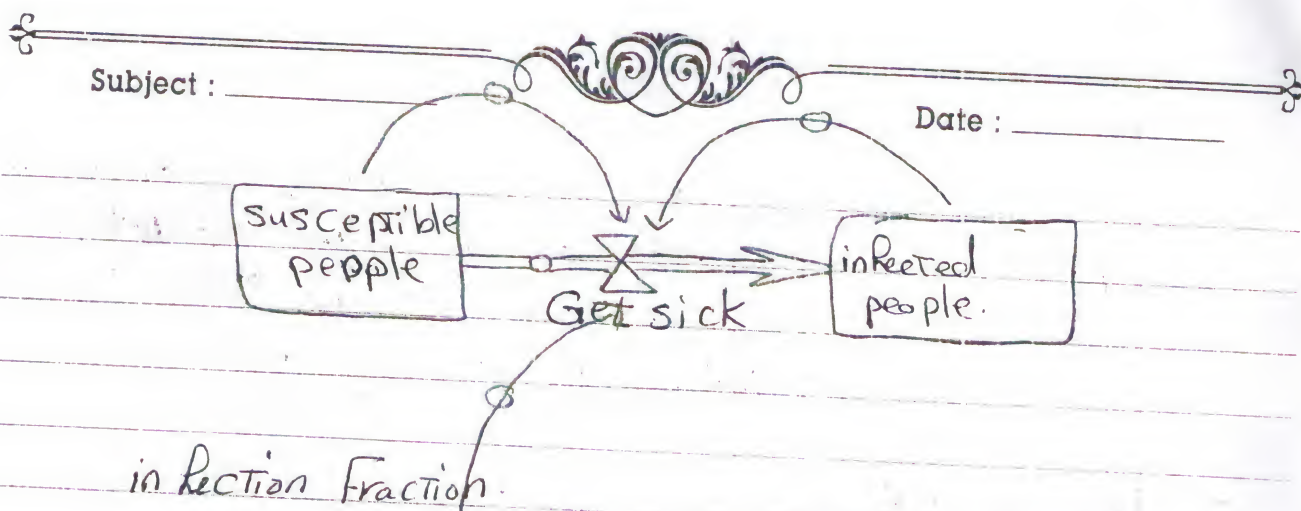
Step 1: Adding Box variables.

On Monday, 100 students return to school one of whom has the Flu. As time passes, the sick student infects his classmates, who in turn go on to infect others.

This could be generalized as follows.

Over time, susceptible people get sick and become infected people.

To begin building the model, create two box variables one for susceptible people and one for infected people. These will allow you to keep track of how many healthy and sick people there are.



② Step 2 Adding a Rate.

use a rate to connect these two box variable. it represent a place in the system where something happens. Since this rate represents the number of people who change from susceptible to infected, name it Get sick.

③ Step 3 Adding an Auxiliary variable

To help calculate the rate at which susceptible people become infected people. call this variable infection fraction. it is an efficient notation.

④ Step 4 Adding Connectors.

ven sim PLE needs instructions about which elements depend on each other. Like the rate Get sick depends on the number of susceptible people, the number of infected people.